# Mapping the Village Database : The Spread of Economic Growth to Rural Areas of Northeast Thailand (<Special Issue>Transformation of Agriculture in Northeast Thailand)

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# Mapping the Village Database: The Spread of Economic Growth to Rural Areas of Northeast Thailand

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## I Introduction

The Thai government conducts a village survey covering all villages in rural areas of the kingdom. The first trial survey was conducted in 1982, since when the survey has been repeated every two years. I have devised a computer program to visualize the data of these surveys in map form. To demonstrate the potential utility of the program, I have mapped for Northeast Thailand several indicators related to the economic growth of Thailand since the 1980s.

The remarkable economic growth of Thailand started in the latter half of the 1980s, before the first trial survey was conducted. It first transformed the Bangkok metropolitan area drastically, engendering an increase in employment opportunities there, and attracting large-scale migration from rural areas, especially the Northeast, which was economically much behind the other regions. Besides the cultivation of cash crops, work away from home became an important source of cash income and transformed the rural areas. This rural transformation has been studied by many researchers, who usually focus on one or a few specific target villages or areas (see, for example, [Kitahara *et al.* 1995; Nakada 1995]).

I have approached the same question within the scope of the whole of the Northeast region by making use of the village database and its mapping.

The village database covers many items related to the socio-economic environment of rural areas in order that it may be used for formulation of rural development plans. The survey is conducted in a uniform manner over the country simultaneously, and it is repeated at regular intervals. Thus, it is very suitable to identify the spread of a transformation over a wide region. The village-level basic data have a great potential for research purposes if used properly.

I have developed a Northeast Thailand Village Information System (NETVIS) to make the village database visible [Nagata 1995; 1996].

Below, the structure and some problems of the village data itself as well as NETVIS

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are described. Then the NETVIS outputs are applied to a study on the spread of economic growth in the rural Northeast in order to demonstrate the potential utility of NETVIS.

## II The Village Database and NETVIS

### 1. *The Components of NETVIS*

NETVIS is composed of a unit of databases and a unit of mapping[1] (Fig. 1). The former includes the following databases: (a) single-year village databases; (b) a village position database, which is indispensable for mapping; and (c) a village identification database, which correlates the data sets of a village in different survey years. The village databases were acquired from the Information Processing Institute for Education and Development, Thammasat University. The unit of mapping includes programs which calculate and modify the data in the unit of databases in order to map them.

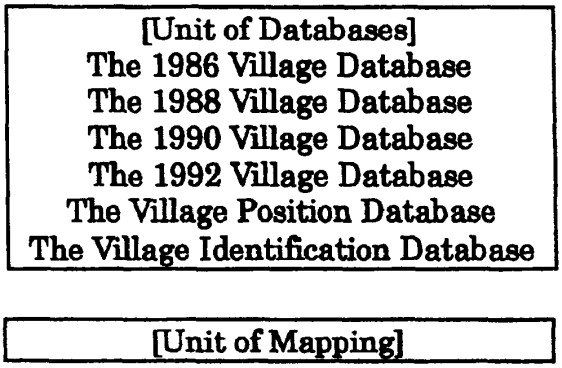


**Fig. 1** The Components of NETVIS

### 2. *Items of the Database*

The National Rural Development Committee, which is under the Office of the Prime Minister, and its working organization, the National Rural Development Cooperation Center, conduct the village-level survey to collect data related to the socio-economic situation of each village in rural areas of the kingdom. Villages in suburbs are excluded.[2] Every two years, each Tambon Development Committee surveys the situation of the villages in its *tambon* (sub-district) and completes a questionnaire.[3] After the higher

1) NETVIS is constructed on MS-Access 2.0, which is a database management system software on MS-Windows 3.1 for personal computers.

2) The total number of target villages was 54,869 in the 1986 survey and 59,640 in 1992 [CDD 1993 : 2]. The numbers in Northeast Thailand were 23,215 and 25,906, respectively.

3) According to the instructions for the questionnaire of the 1994 survey, three questionnaire books are assigned to each village and each book should be filled in by a different survey team member. After the preliminary survey, the survey team should check the results of the three books at a meeting of the Tambon Development Committee. If they find any ↗

organizations, the Amphoe Development Committee and the Changwat Development Committee, have checked the questionnaires, the data are input into a database at the Information Processing Institute for Education and Development, Thammasat University [Pongsvas 1988: 1-7].

The first trial survey was conducted in selected villages in 1982 and this was expanded to all villages in 1986. Since 1990, the survey has been conducted with the approval of the cabinet. Since the 1986 survey, the results have been input into a database. The surveys since 1986 cover a wide range of information, including infrastructure, production environment, education, and hygiene, as well as basic information on population and households (Table 1). The items tend to become more detailed but questions related to disputes and trials were removed after the 1990 survey.

### 3. *Reliability*

The village database offers very useful information, particularly for the purpose of investigation of a large region. However, there are some drawbacks: careless mistakes, which occur when the questionnaires are completed or the data input into the computer, questions essentially difficult to answer accurately, and so on.

Some careless mistakes can be checked by the internal consistency of the data. Not only the total village population, but also its breakdown by sex and age are given. Furthermore, four sets of data for different years are presently available. These allow cross-checking and, in some cases, correction of figures.[4] Some of the extreme values are apparently due to input mistakes. These could be corrected by comparing with the data of the previous and/or following surveys.[5]

One example of the questions essentially difficult to answer correctly is the average yield of rice of a village as a whole. It is evident that substantial variation in yield within a village arises due to variations in land conditions. Damage due to flooding, drought, pests, etc. also vary from one field to another. It is apparent that the village surveyors do not assess the yield for individual fields or even individual holdings. Yet, they are often able to present a reasonably accurate estimate of the average value, though how they do so is not known [Kono *et al.* 1992: 245].

Thus, it is certain that errors exist. Their frequency of occurrence, which differs from one item to another, is difficult to assess. These defects, however, are compensated by the coverage of a great number of villages. The database can provide useful and other-

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misinformation, they should repeat the survey to get more reliable information [CRDPLP 1994: 2-3].

4) The percentages of apparent mistakes in the four sets of demographic data for 1986, 1988, 1990 and 1992 range between 4.2% and 8.2%. By cross-checking, 92% and 90% of the mistakes were corrected for the 1990 and 1992 surveys, respectively.

5) Common mistakes are, for example, misreading of the figure 1 as 7 since the survey books are hand-written, and omission of 0, as in 23 for 230.

**Table 1** Entries of the Village-Level Survey

| Entry | Details |
|---|---|
| Population | population; number of households; municipal area; occupation of reserved forest; property tax |
| Water resources | wells; ponds; water resources for agriculture |
| Public facilities | religious places; rice banks; cattle banks; schools; meeting rooms; libraries; hospitals; cooperative shops; police stations |
| Electricity | electric power supply; television sets |
| Transportation | roads to district office and market; pavement condition; time required to district office and market; public vehicles; operation in rainy season; ownership of vehicles |
| Housing amenities | material for roofing; lavatories |
| Fuels for cooking | materials; means to procure; place to procure |
| Agricultural activities | membership of agricultural groups; means to procure capital |
| Occupation | households engaged in single occupation, multiple occupation; average annual income |
| Rice cropping | households according to the size of farming; cropping times; yield; price; recommended varieties; manuring |
| Upland farming | for short- and long-term crop separately: crop kind; number of households; season; size of farm; yield; price; manuring |
| Horticulture | crop kind; number of households; size of farm; annual sales |
| Orchard | crop kind; number of households; size of farm; annual sales |
| Rubber | number of households; households subsidized by the government; households not achieving target |
| Dry season cropping | water source; number of households; annual sales |
| Livestock | number of households; annual sales; number of animals; death situation; household conducting vaccination |
| Fishery | catch: number of households; annual sales |
| | culture: number of households; size of farm; annual sales; death situation |
| Home industry | kind; number of households; annual sales |
| Cultivation | ownership and rental of cattle; ownership and rental of farm machines |
| Land | total area; registration level; farming area; planted area; reason not planted; soil condition; ownership of farm land |
| Education | numbers according to the last graduated school; number of students |
| Training | times and participants of training for vocations, self defense, etc. |
| Activities | times and participants of religious, cultural and sport activities |
| Hygiene | babies: newborn; postnated death; maternal death in childbirth |
| | infants: nutritional condition |
| | children and adults: patients and death by kind of diseases |
| | women: family planning; vaccination |
| Work away | number of households; person; kind of job; place; term; dominant age group |
| Others | general comparison with other villages nearby; issues to improve the environment |

Note: This table is a revised version of [Kono *et al.* 1992 : 244, Table 1].

wise unacquirable information, but at the same time, we must keep in mind its defects.

4. *The Village Identification Database*

Two components of the village database are a set of data for a village tagged by a unique identification number, and a look-up table that relates the number to the name of village.

The identification number comprises eight digits, of which consecutive pairs from the left represent *changwat* (province), *amphoe*[6] (district), *tambon* (sub-district), and *muban* (village). The identification numbers are not necessarily fixed from one survey to the next, because of frequent division and reorganization of the administrative units of all levels.[7] Thus, a given number does not always identify the same village in different surveys. Therefore a separate database for identification of villages over the years was prepared.

5. *The Village Position Database*

The positions of villages are indispensable to map the basic data. However, this information is not found in the village database. The geographical coordinates of villages must be found by other means.

A set of topographical maps of 1 to 50,000 scale prepared by the Royal Thai Survey Department (RTSD), supplemented by maps of 1 to 250,000 scale was used for this purpose. Since these maps were produced between the 1960s and the early 1980s, they does not show the many newly established villages. From the maps alone, more than one-third of the villages remained unidentified. Discarding these will cause misinterpretation of the data, so other means of identification must be sought.

In some cases, the database itself provides clues. It often happens that one village is divided into two or more as a result of population increase.[8] In such cases, a map may show the name of the original village but not the others. By comparing some items of the databases, such as the number of households, and the distance and time to a district office, in successive surveys we might be able to discover that these villages form a single natural village that has been split administratively.

Another means is to examine a wall map at a district office. Some of them are rough like a guide map, while others are very detailed, being based on a topographical map. Roads shown on these maps are helpful to locate some villages.

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6) In this paper, *amphoe* includes *king amphoe*, a district newly established and not yet categorized as a full *amphoe* in local administration system of Thailand.

7) In 1993, Changwat Amnat Charoen was newly established by separation from Changwat Ubon Ratchathani, and Changwat Nong Bua Lamphu was separated from Changwat Udon Thani. The number of *amphoe* in Northeast Thailand increased from 257 in 1986 to 270 in 1992. At the lower administrative levels, many new units are established every year.

8) The increase in the number of administrative villages in the region was mostly caused by this reason. Another reason is the recognition as an independent village of an isolated hamlet which was formerly part of a larger village.

The coordinate data of a village indicate the central point of the village in terms of longitude and latitude. Where one natural village is split into two or more administrative units, the central point of the natural village represents that of all the administrative villages.

By these means, the locations of about 82% of villages have so far been identified and input into the village position database.

6. *Data Mapping*

A data map can be produced by putting a mark designating a datum for each village on its corresponding position. This method would produce many overlapping marks where the density of villages is high, resulting in a map in which the village, and hence, the population density is always emphasized rather than the characteristics of the villages themselves.

Therefore, I chose a popular method in the geographic information system (GIS), that is, masking meshes. The data maps presented in the following section were composed by calculating an average value of each mesh. The meshes are of three-minute intervals of both longitude and latitude. This interval was chosen after several trials. The three-minute intervals create a mesh of 5.3 to 5.4 km from east to west and 5.5 km from north to south. Each mesh contains 0 to 23 villages, with an average of 4 to 5.[9] To calculate an average in a mesh is also effective to minimize errors.

## III Some Effects of the Economic Growth on the Rural Northeast

To demonstrate the potential usefulness of NETVIS, data maps produced as just described are presented below. The maps show selected indicators of transformation of the rural areas of Northeast Thailand.

1. *Population*

The aggregated rural population of the Northeast based on the village database is 14.07 millions in 1986 and 14.23 millions in 1992. According to the 1990 national census of the National Statistical Office (NSO), however, the total population of the region is 19.04 millions, of which 16.26 millions live in rural areas. This disagreement is partly due to differences in the definition of "rural population": the former counts only those whose basis of livelihood is in a village, while the latter includes everybody who resides there.[10] According to the village surveys, the rural population of Northeast increased by

9) Zero villages means that there is no center point of an administrative village in that mesh. It does not always mean that nobody lives there.

10) The village survey does not count those in collective households or institutional population such as soldiers, policemen, government officials and monks, while the census does [NSO 1993a : 2-9].

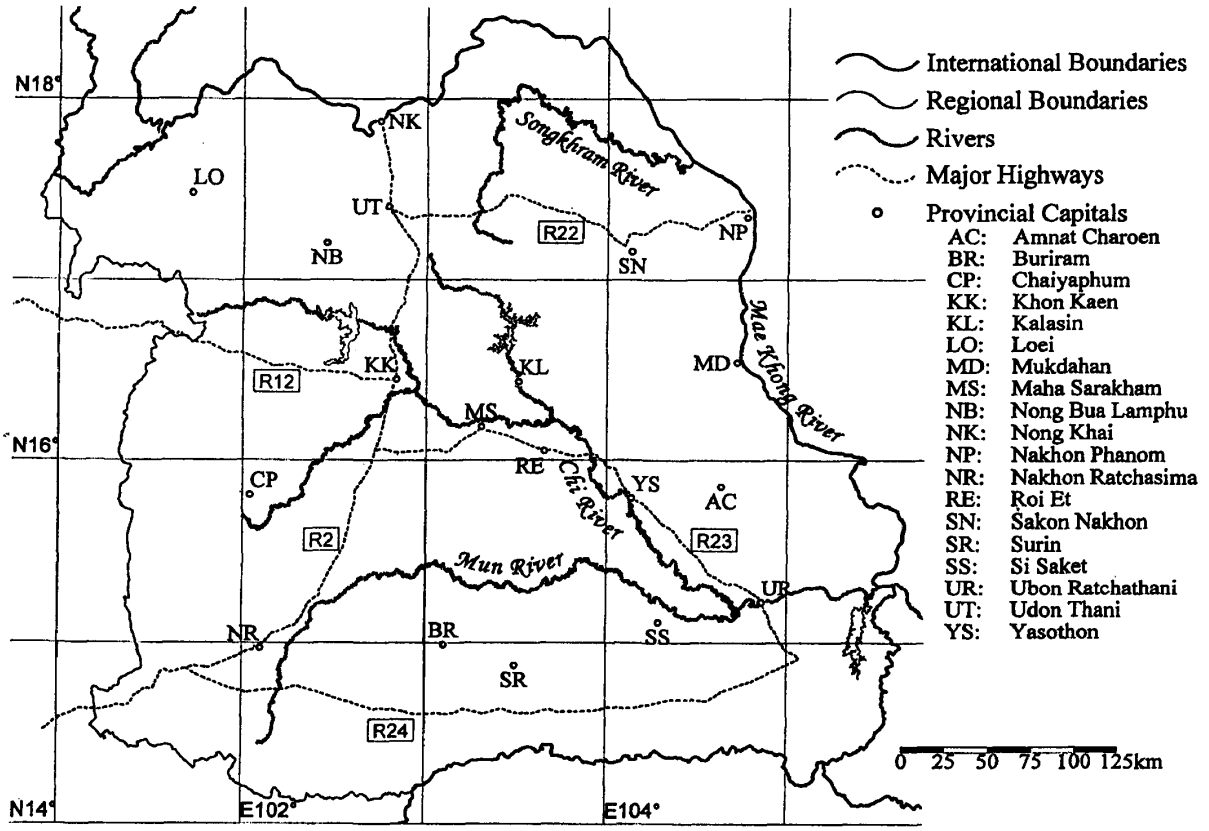


**Fig. 2** Northeast Thailand

only 1% between 1986 and 1992 (0.19% per annum).[11] During the same period, however, the number of households in the rural areas increased from 2.44 millions to 2.76 millions (2.03% per annum), while the average size of a household shrank from 5.8 to 5.2 persons per household.

Fig. 3 shows the population density and the annual rate of increase between 1986 and 1992. The high density areas are the south of the Mun River, the Chi River Basin, and a narrow belt along the northern foothills of the Phu Phan Range. The intraregional variation of the rate of increase is not clear, but the rate tends to be higher where the density is relatively low.

### 2. *Work Away from Home*

The village survey defines working away as working outside the *tambon* regardless of frequency and period. Fig. 4 shows the percentage of households whose member or members engage in work outside the *tambon*. About 80% of them work in the Bangkok metropolitan area.[12] In 1986, 25% of households in the whole Northeast had at least one

11) According to the registration record, the total population of the region increased by about 8% during the same period [NSO 1990 : 20-21; NSO 1993b : 16-17].

12) The village survey asks about the dominant place to work.

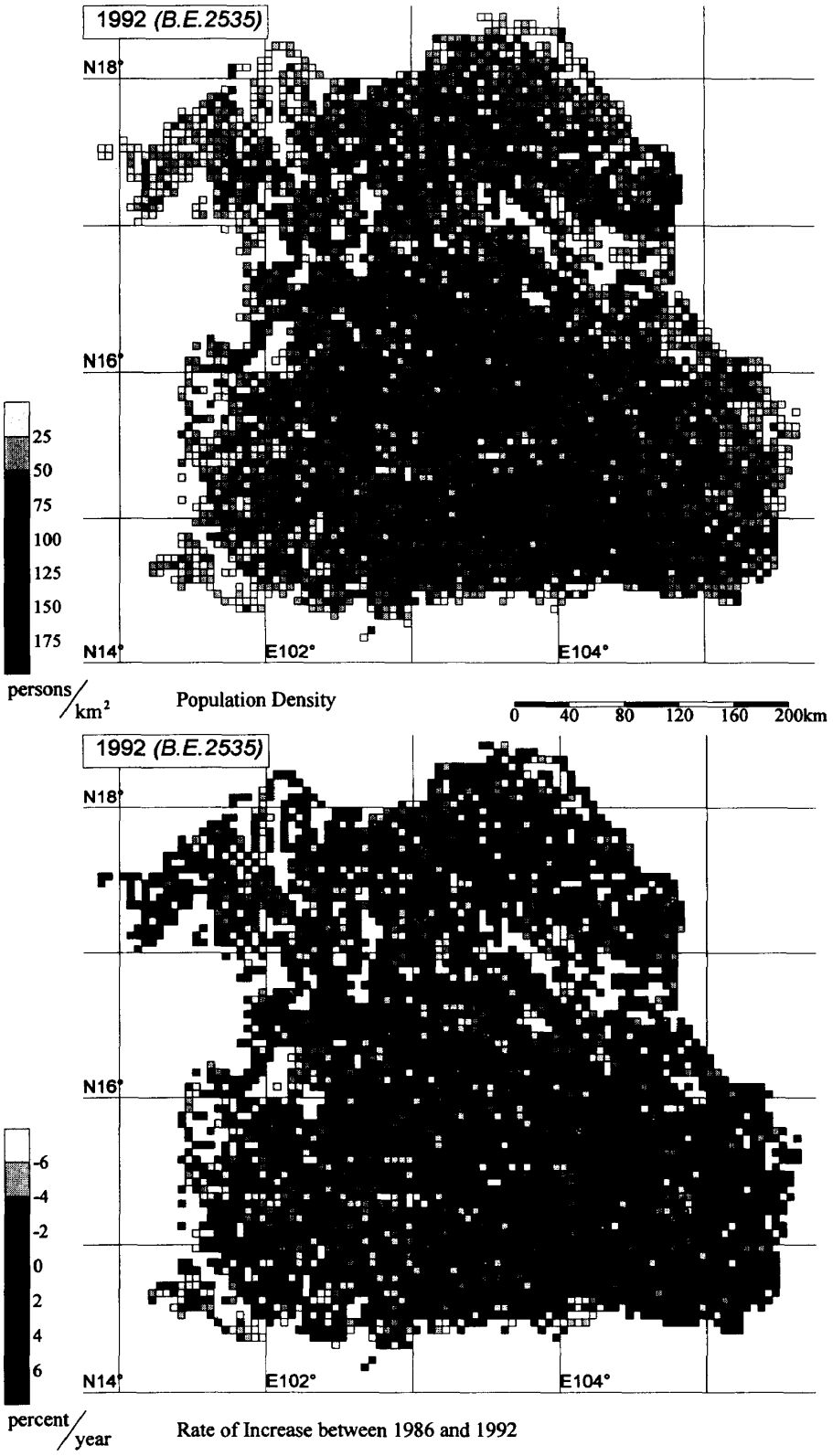


**Fig. 3** Population

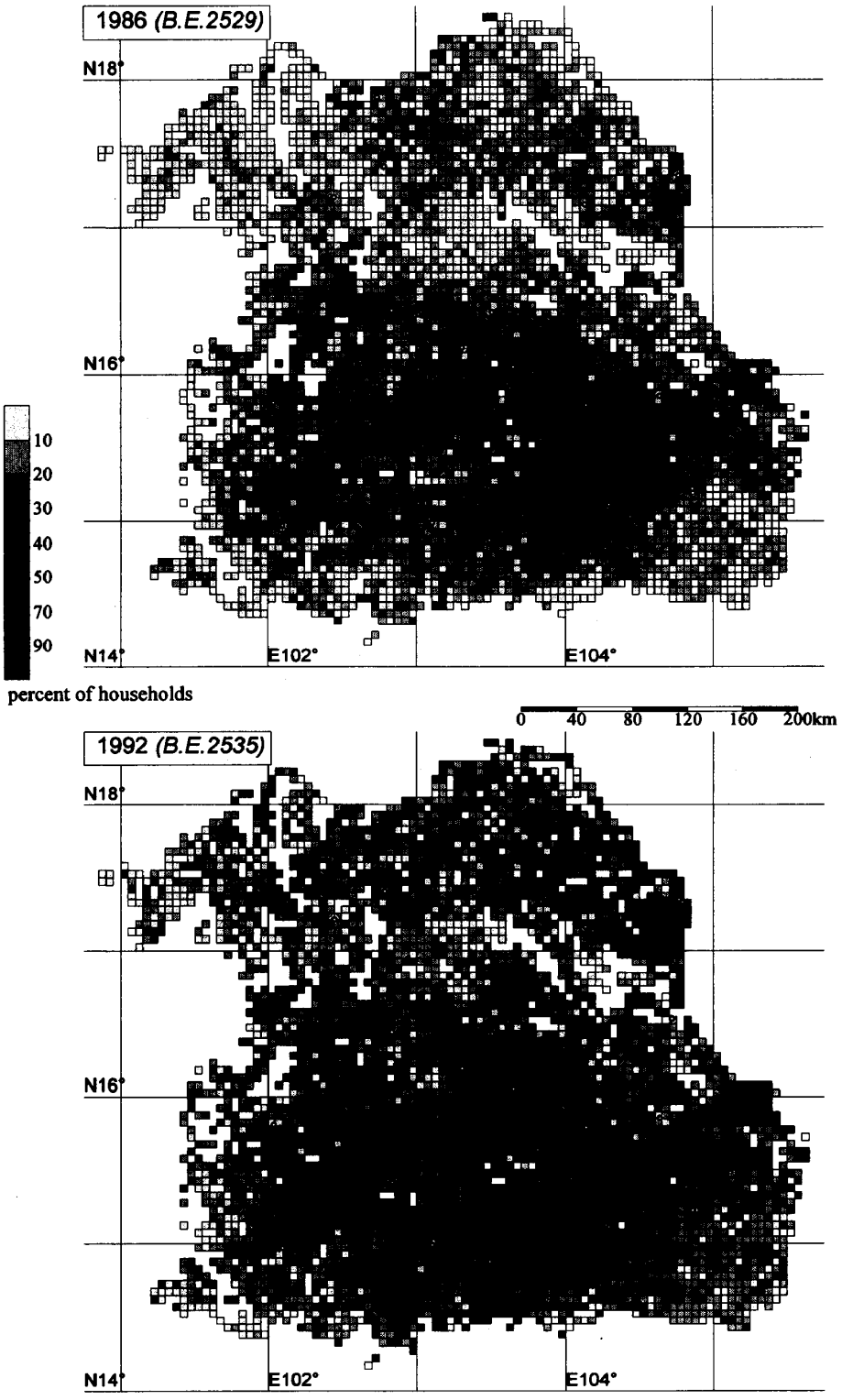


**Fig. 4**　Households Engaged in Work outside the Tambon

member engaged in work outside the *tambon*, and the percentage rose to 35% in 1992. [13] The percentage varies greatly from one area to another. In 1986, the area with the highest rate of work away from have centered around Ubon Ratchathani, Yasothon, Amnat Charoen and Si Saket, and extended to Changwat Roi Et, the southern part of Changwat Maha Sarakham, Phimai and Nakhon Ratchasima.

After 1986, the rate increased everywhere in the region. In 1992, the northern *changwat* such as Udon Thani, Nong Khai, Nakhon Phanom and Sakon Nakhon formed another high-rate area. In the south, too, the high rate extended to Buriram and Surin. Some areas, however, remained low-rate areas even in 1992: the south of the Mun River within Changwat Ubon Ratchathani, the area around the Phu Phan Range, the western part of Changwat Chaiyaphum, Changwat Loei and so on. These areas roughly correspond to the areas of upland cropping or poor transportation.

3. *Infrastructure*

Fig. 5 shows the percentage of households supplied with electric power. In 1986, the electric power supply was available in a belt from Khon Kaen to Ubon Ratchathani, where population density was relatively high, and around major local cities. In 1992, only a few areas were left unsupplied.

The village survey inquires about the number of television sets in a village. Fig. 6 compares the average number per household in 1986 and 1992. In 1986, the distribution corresponds to that of electric power supply, as a matter of course. In these areas, one out of several households had a set. In 1992, television became popular all over the region with the increased availability of electricity. The average number per household also became greater. On average, nearly every household had one set in the areas around such big cities as Nakhon Ratchasima, Ubon Ratchathani, Khon Kaen and Udon Thani. The rate, however, was much lower in the other areas. Ownership of a television set became an indicator of wealth in 1992, whereas electric power supply had been so in 1986.

4. *Vehicles*

Generally speaking, bicycles are popular all over the region and there has been no significant change over the years under discussion (Fig. 7). A close examination of the data map, however, reveals several areas where bicycles are less popular. In some of them, motorcycles are popular instead (Fig. 8). The western part of Changwat Loei and the northwestern part of Changwat Chaiyaphum are such cases. The relative unpopularity of bicycles there is apparently due to the relief (many ups and downs) rather than economic conditions. In other areas, both bicycles and motorcycles are fewer, which is thought to reflect economic hardship. Amphoe Ban Phai of Khon Kaen and Amphoe

13) The average number of persons per household engaged in work outside the *tambon* was 1.7 in 1986 and hardly changed between 1986 and 1992.

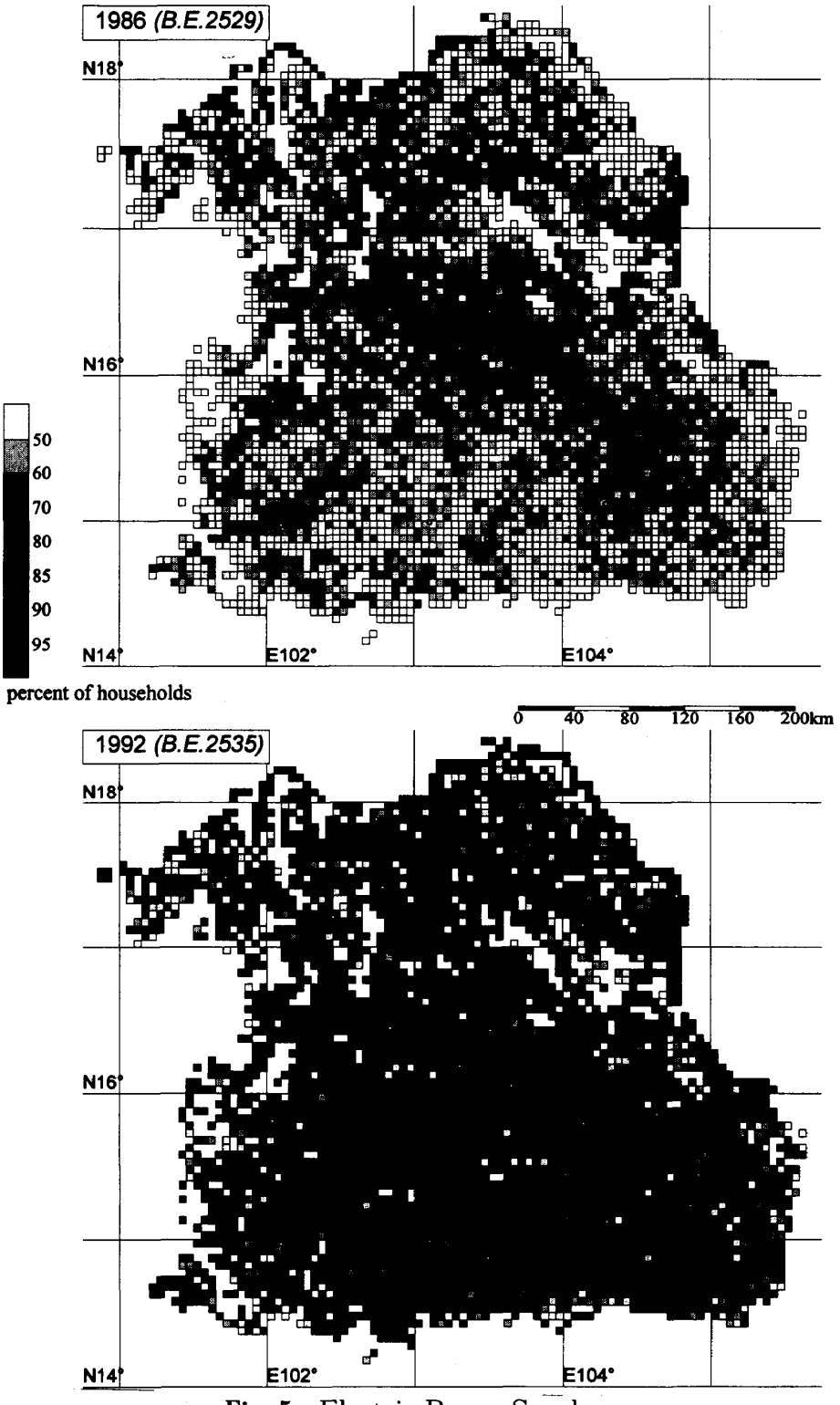


**Fig. 5**　Electric Power Supply

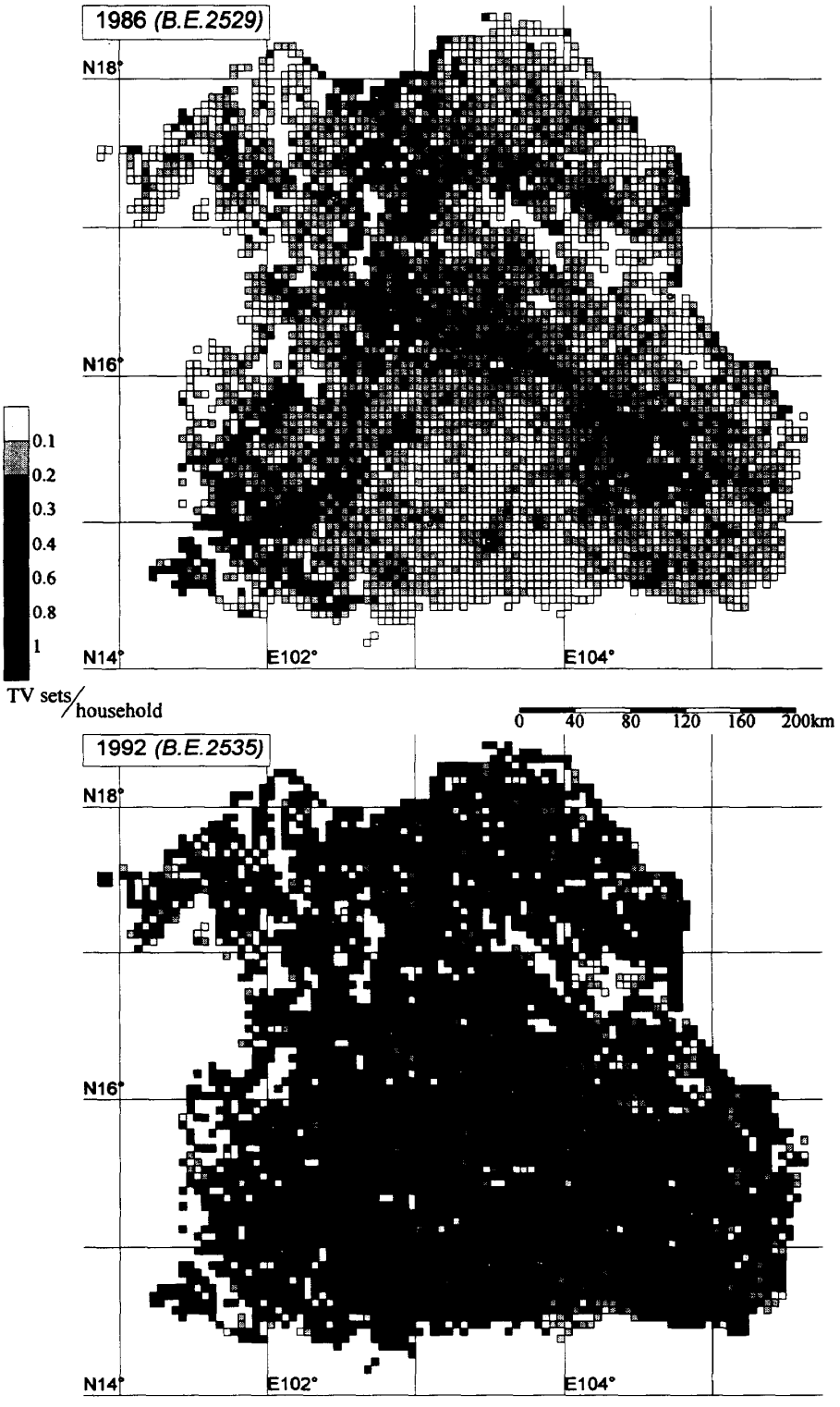


**Fig. 6** Television Sets

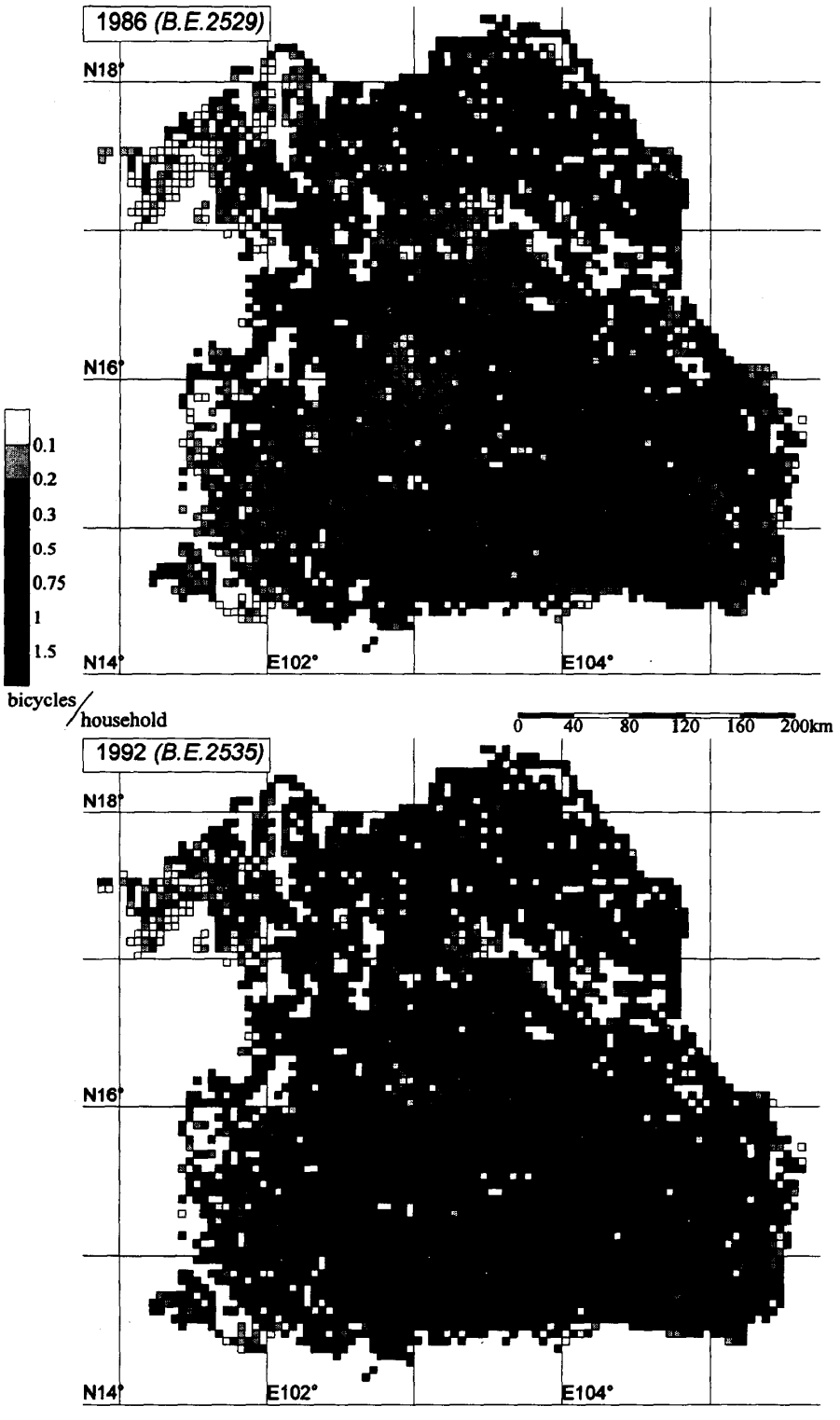


**Fig. 7**　Bicycles

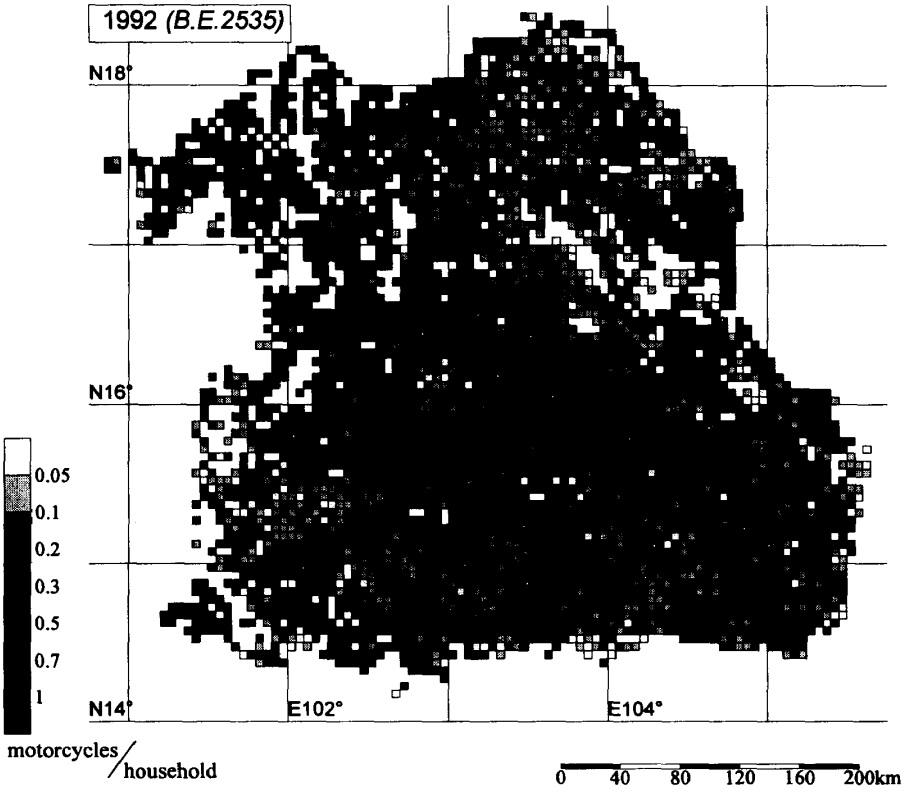


Fig. 8 Motorcycles

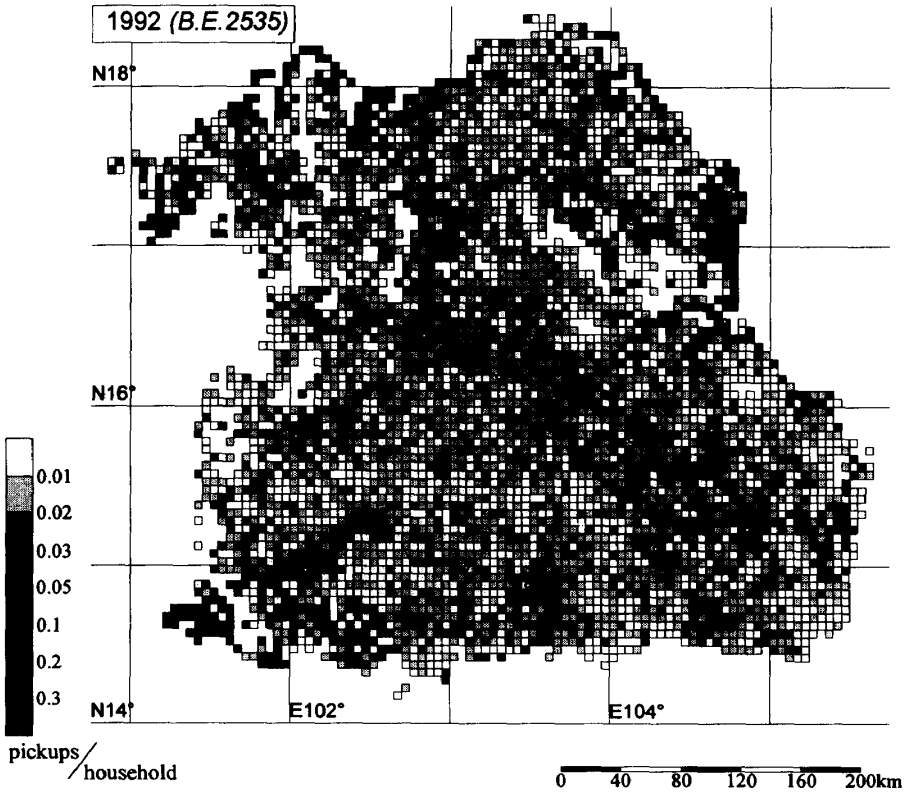


Fig. 9 Pick-up Trucks

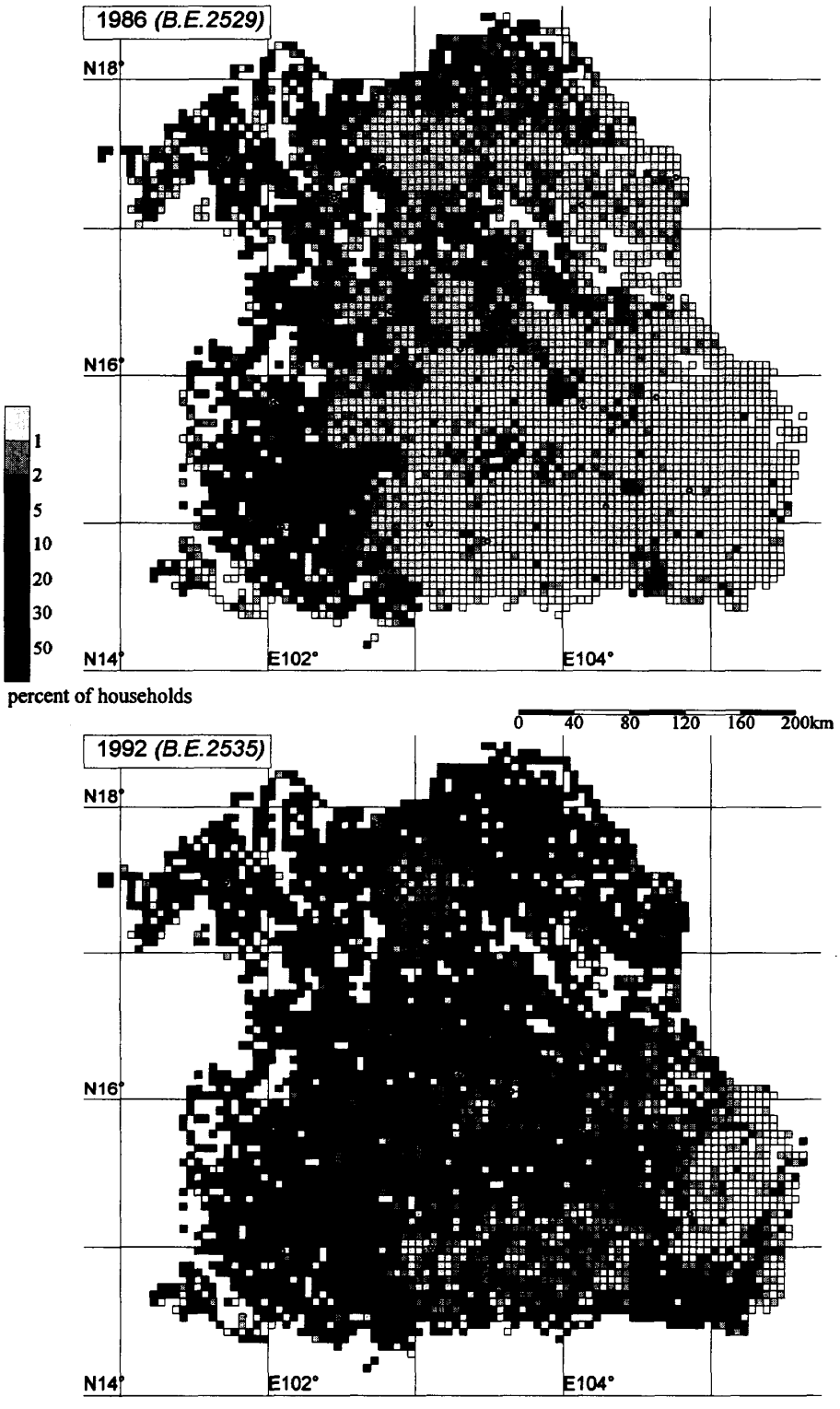


Fig. 10 Power Tillers

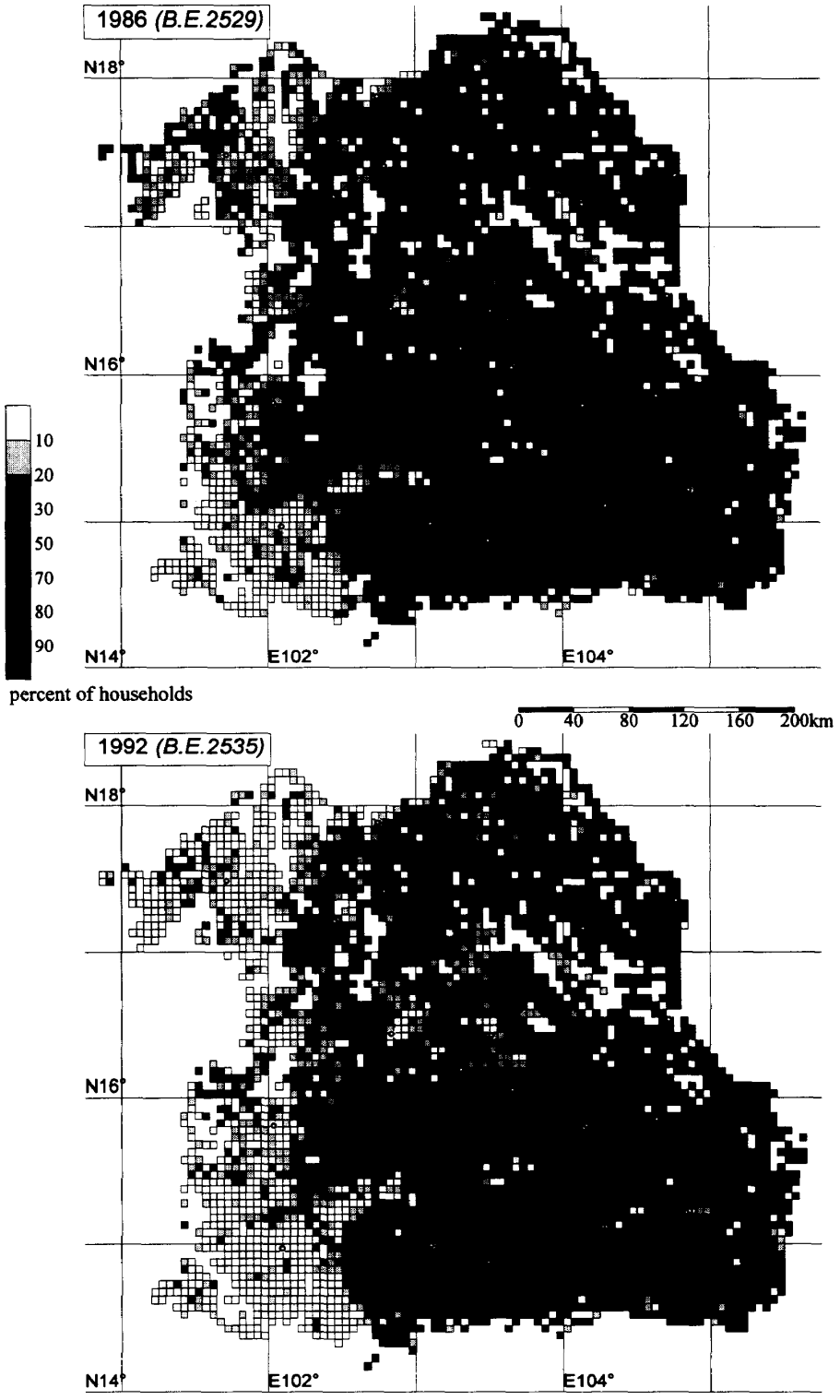


Fig. 11 Cattle for Farming

Borabu of Maha Sarakham are such cases.

The two maps showing the distribution of motorcycles (Fig. 8) and pick-up trucks[14] (Fig. 9) suggest that the popularity of motorized vehicles is related to (1) road conditions, (2) trading posts and (3) local cities.

First, these vehicles are popular along the major trunk roads: Route 2 (from Bangkok to Nong Khai via Nakhon Ratchasima and Khon Kaen), Route 22 (from Udon Thani to Nakhon Phanom via Sakon Nakhon) and Route 23 (from Khon Kaen to Ubon Ratchathani). Second, high popularity is seen around the centers of trading with Laos along the Mae Khong River: Nong Khai and from Nakhon Phanom to Mukdahan. Third, more vehicles are used in the vicinity of large cities: Nakhon Ratchasima, Khon Kaen, Udon Thani, Roi Et and Ubon Ratchathani.

5. *Farm Machinery*

Fig. 10 shows the ownership of power tillers. By 1986, they were already popular in upland cropping areas: western Nakhon Ratchasima; Changwat Chaiyaphum; western Khon Kaen; Changwat Loei. In 1992, they had spread to eastern Nong Khai, the area along the Chi River from eastern Khon Kaen to Yasothon, the surroundings of the Lam Pao Reservoir in northern Kalasin, and the area along the Mun River from southern Roi Et to northern Surin. Comparison of the maps showing power tillers and cattle (Fig. 11, the ownership of cattle for farming) clearly indicates replacement of the latter by the former.

## IV Conclusions

In this paper, the village database was briefly introduced and its advantages and disadvantages were appraised. It is thought that the database has a great potential to become powerful tool for research if properly processed and, particularly, visualized on map. Next, NETVIS, a computer program which I have developed for mapping the village database, was explained. Third, to demonstrate the potential utility of NETVIS, several indicators related to the transformation of the rural areas that has resulted from the vigorous economic growth of Thailand since the late 1980s were selected and mapped by using NETVIS.

The maps thus produced revealed not only the significantly great intraregional variations, but also certain characteristic spatial patterns. Further analysis of these patterns should give clues for studying the interrelationship of factors related to the transformation of the rural areas. The pattern analysis should also reveal a regional division when combined with analysis of the physical environment.

The maps produced by NETVIS are derived from the village database, which

14) In the village survey, *rot pik-ap* (pick-up truck) and *rot i-taen* (farm truck) are treated separately. And pick-up does not include the latter in this paper.

embodies contact information, while remote sensing generates a noncontact information. Acquisition and processing of the former need a great labor and time, while the latter are readily available thanks to sophisticated technology. It is more difficult to maintain homogeneity in the former than the latter. Both, however, have their own merits and demerits and are complementary to each other. Ideally, both sources of information should be combined. One way to realize this is mapping or visualization of the contact information. NETVIS is a first step toward this goal.

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